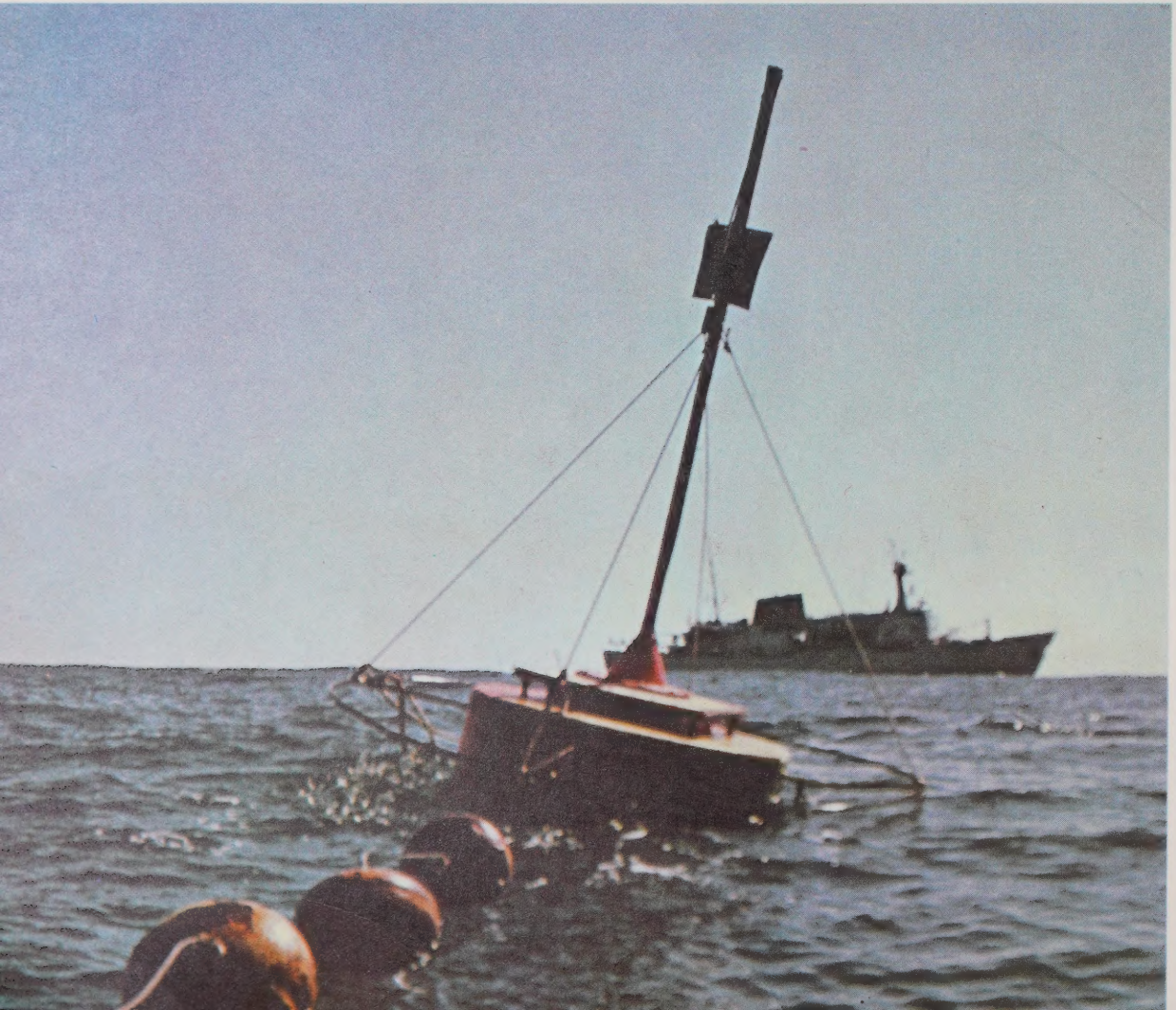
CSS HUDSON

Department of Energy, Mines and Resources

The sea never changes and its works, for all the talk of men, are wrapped in mystery. (Conrad)



Canada possesses one of the longest coastlines in the world and is bounded north, east and west by three oceans.

It has a continental shelf of some 500,000 square miles of great potential resource wealth.

It has, in its arctic regions, a vast frontier with vast potentialities.

It has built up a valuable fishing industry which requires a continually improving knowledge of marine conditions to maintain and increase its efficiency.

Canada, like other maritime nations, is enlarging its studies of the sea.

CSS HUDSON

The Canadian Scientific Ship, *Hudson*, is one of the most modern research vessels in the world. She was built in the early 1960's as part of Canada's expanding program in oceanographic research and is capable of operation in the world ocean.

The *Hudson* is the major ship of the fleet of the federal Department of Energy, Mines and Resources, and works out of the Bedford Institute of Oceanography at Dartmouth, Nova Scotia. Her main area of operations is the North Atlantic Ocean and the adjacent arctic waters.

TYPE OF VESSEL

CSS *Hudson*, the first Canadian ship specifically designed for hydrographic and oceanographic research, is a twin screw, diesel electric vessel, 296 feet in length, with a displacement of 4,800 tons. She has a draft of 20½ feet and gross and net tonnages of 3,721 and 1,686.

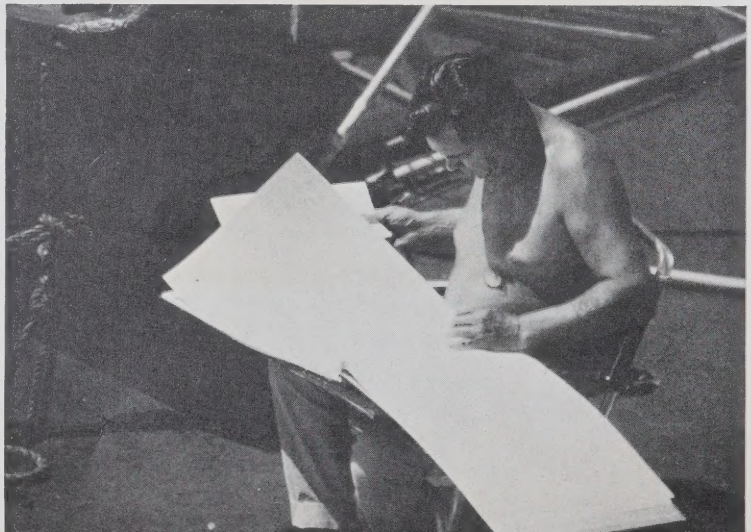
PROPULSION—Four diesel engines drive four main generators, supplying propulsion power, 7,500 bhp, via electric motors to two fixed-blade propellers. Diesel fuel capacity is 1,276 tons.

The bridge

Much repair work to ship and scientific equipment is done at sea by the ship's crew

The ship's chart room is adjacent to the bridge. The first officer (right) obtains information on weather and surface conditions from the Radio Fax

The chief engineer takes advantage of the sun to bring his records up to date



The *Hudson* cruises at 14 knots, with a maximum speed of 16½ knots. Her cruising range is 15,000 miles and she is ice-strengthened and sufficiently powerful to permit effective and safe movement in ice-infested waters.

Electrical Power

Electrical energy in the form of direct current is supplied from four separately excited 1,500-kw 600-volt generators to operate the two propulsion motors.

Auxiliary electrical energy in the form of alternating current, 3-phase, 60 cycles per second, at a constant line pressure of 440 volts is supplied by two 600-kw, 450-volt, 3-phase, 60-cycle, 80 per cent power factor diesel-driven generators arranged for parallel operation. One 175-kw, 450-volt, 3-phase, 60-cycle diesel-driven emergency generator is also installed.

440-VOLT SERVICES—engine room auxiliaries, excitation units, mooring winch, steering gear, windlass, boat winches, ventilation, refrigeration and deck machinery.

The following services are supplied through the necessary transformers from the 440-volt system.

1. *Lighting: 115 volts, single phase ac.*
2. *Navigation aids: 115 volts, single phase ac.*
3. *Miscellaneous power such as small motors up to 25 hp: 115 volts, single phase ac.*
4. *Galley and pantries: 220 volt, 3 phase ac.*

A technician repairs the ship's radar

The *Hudson* is fitted with the most modern navigational devices including precise radars, echo sounders, and both long- and short-range electronic positioning devices.

Navigational Aids—Sperry gyrocompass, magnetic compasses, Walker Commodore log, Sal-24 marine log, direction finder, three Decca radars, Loran, Decca Mark XII receiver course recorder, Sperry auto pilot.

Echo Sounders—One EDO185 range 0-6,000 fathoms, one Kelvin Hughes MS26B, range 0-720 feet or fathoms, one K. & H. MS26J, range 0-4,500 fathoms.

Communication Equipment—One Marconi "Globespan Console" incorporating the following: M/F transmitter, H/F transmitter (with provision for R/T and C.W.) and auto-alarm; two 11-band receivers, emergency transmitter, emergency receiver; one Canadian Marconi CN86 R/T, one VHF set.

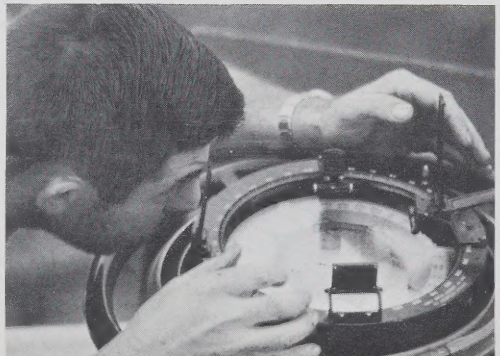
Charlie George Dog Charlie on watch

During a cruise, briefings are held, generally in the ship's lounge, to plan strategy, coordinate the various sectors of the work program and to assess the rate of progress and the results obtained

Hydrography and Oceanography

Chart Room — The *Hudson* has an extensive chart room complete with the latest cartographic equipment and facilities for making provisional charts at sea. It also serves as the data processing centre in which advanced electronic systems, including computers, are employed to record and process a wide variety of measurements in a form suitable for immediate on-the-spot display and assessment by the scientist.

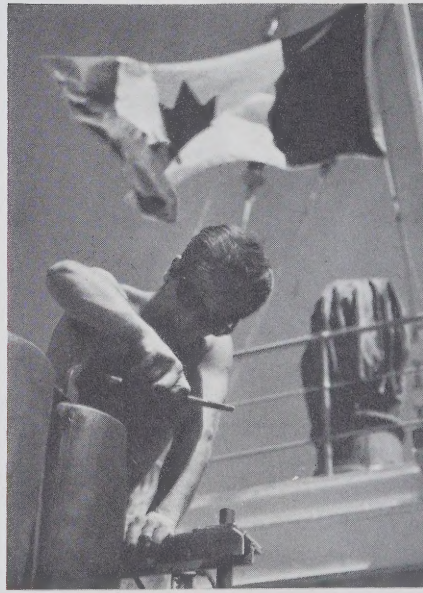
The measurements are, typically, of sea temperature, salt content, ship position, water depth, gravity, and magnetic field of the earth.



An oceanographer obtains a direction from the gyrocompass

Radar transponder buoys are used to help maintain ship position within the survey area

Painting is a never-ending task



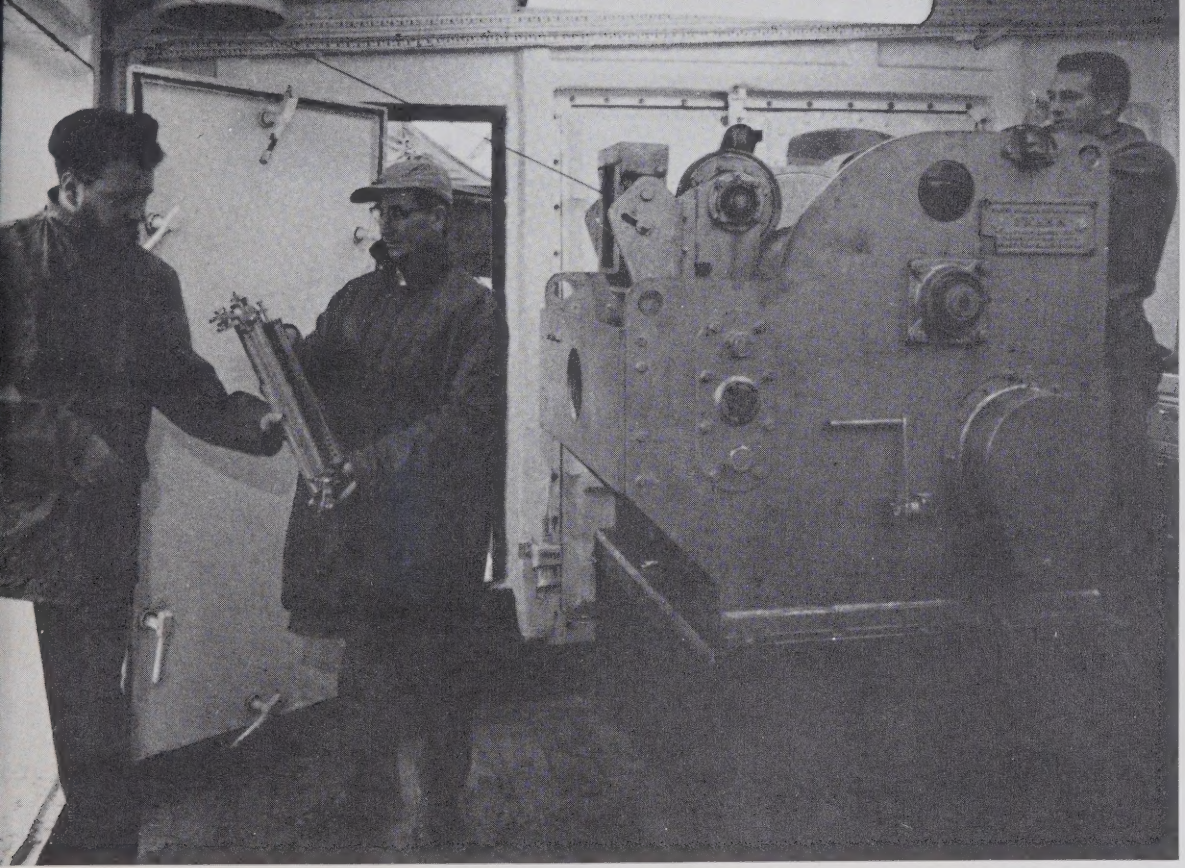
The hydrographic chart room

Sediment corers penetrate the sea floor

A marine geologist examines a core of sediment (estimated to be over one million years of age) from the sea floor

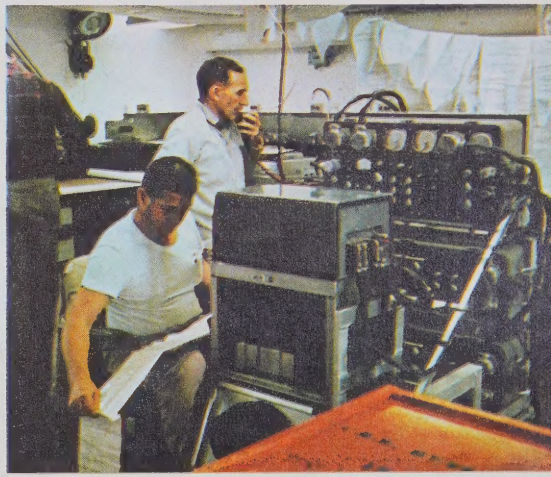
Laboratories—The vessel, a floating research base, has six laboratories with a total area of over 3,400 square feet. These are the boat deck, oceanographic, general-purpose, geochemical and chemical, core and sample, and gravity laboratories. Each is equipped with modern facilities and instrumentation.

Winches—The vessel carries a number of winches of various sizes and capacities to handle many different kinds of equipment and instruments in the sea. Some have upwards of five miles of wire rope on their drums for working to great oceanic depths. Others are equipped to handle electrical cables that permit direct and continuous recording on shipboard of various characteristics of the sea as measured by instruments suspended on these cables, perhaps at depths of several miles. These are used for many scientific purposes, such as drawing water samples from various depths, handling meters for measuring currents, lowering underwater cameras and lights, obtaining samples from the ocean floor and netting biological specimens.



The oceanographic winch room

In the ship's forward lab, an oceanographer determines the oxygen content of sea water



The scientist-in-charge, standing, starts the countdown for the explosion of the next charge during seismic work in Hudson Bay in 1965

"Canteen Open"

The galley

The lounge

The officers' and scientists' dining room

The seamen's cafeteria

A seaman's cabin

Accommodation

The amenities and standards of accommodation in *Hudson* are in keeping with modern-day standards for life at sea on extended cruises. These include comfortable sleeping, recreational and dining quarters for the scientific staff, both men and women, and for ship officers and crew. Laboratory and living spaces are fully air conditioned. There is a well-equipped sick-bay and a doctor is carried on most cruises. The ship's complement is 20 officers, 44 crew and 28 scientific personnel.

History

The $7½ million vessel was designed by Gilmore, German and Milne of Montreal and built by Saint John Shipbuilding and Dry Dock Limited at Saint John, N.B. She was commissioned in February 1964 and made her shakedown cruise to the Bahamas later that year.

The *Hudson* is named after that venturesome explorer and navigator, Henry Hudson, who organized and led four expeditions into the Canadian Arctic in his search for a short route to China. A plaque in the attractive lounge of the *Hudson* commemorates the voyages made by Henry Hudson.

The ship's doctor in his hospital

The captain's cabin

The navigating officer's cabin

The chief scientist's cabin

The mid-water trawl is used by biologists for collecting specimens

Activities

Although Canada is one of the world's largest maritime nations in vastness of area and length of coastline, it is also one of the smallest in size of population. This is an important factor, for oceanography is an expensive science. The cost of operating CSS *Hudson*, for instance, is upwards of $3,000 per running day.

To make the most of its human and physical resources in this field, Canada carries out oceanography on a cooperative basis. The various federal agencies and universities involved work under the general coordination of the Canadian Committee on Oceanography, and contribute ships, laboratory facilities, personnel or funds toward the national effort. The *Hudson's* activities are an integral part of the national program.

Canadian oceanographers have made full use of *Hudson* during her short history. They have, for instance, made a number of cruises to study the circulation of water in the North Atlantic Ocean where many aspects of circulation are a mystery. They are not only studying the Gulf Stream, that large current of warm water that flows from North America towards Europe, but also the many complex motions in the deep ocean, such as currents from the Arctic Ocean, the Mediterranean Sea and even from the Antarctic Ocean.

As a result of several geophysical cruises, they have obtained information on the structure of the rocks forming the sea floor down several miles from the surface to the Mohorovicic discontinuity—the upper boundary of the fluid central part of the earth. They have done this by fitting together the results of their measurements of the force of gravity and of the earth's magnetic field with the data obtained from seismic surveys.

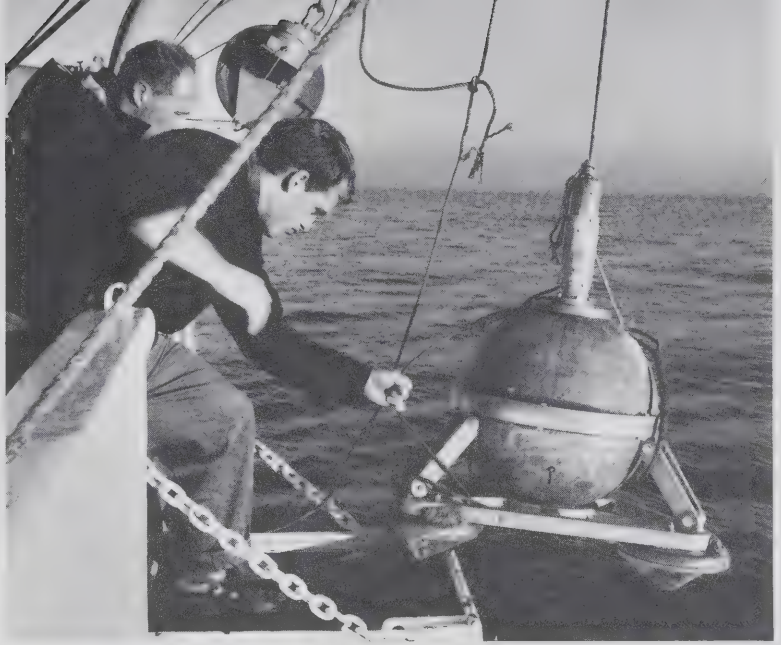
Many of the world's scientists believe that the continents were, at one time, a single land mass and that they have been drifting apart at the rate of a few miles every million years. Geophysicists aboard the *Hudson* have spent many months making an intensive investigation of the Mid-Atlantic Ridge, a great range of undersea mountains, which is likely to provide evidence for or against this theory of continental drift. Using a

10-ton-test steel fishing line, three miles in length, they have brought up samples from the Ridge for study.

Marine geologists aboard *Hudson* have studied the actual floor of the ocean. On one cruise, they discovered rocks on the sea floor, near Sable Island, that contained appreciable amounts of oil, a discovery of considerable interest to the oil companies prospecting off Canada's Atlantic coast.

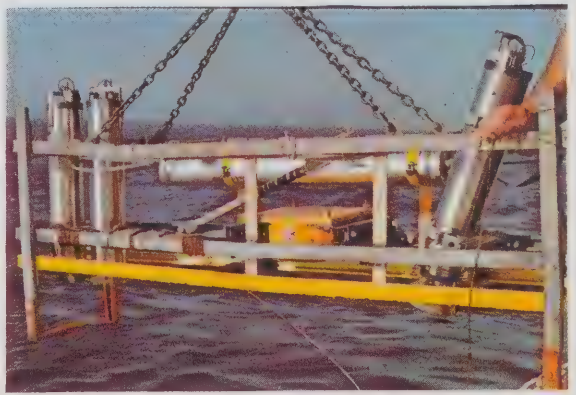
Hudson's major cruise of 1965 was an intensive investigation of the floor of Hudson Bay by scientists of the Bedford Institute of Oceanography, the Geological Survey of Canada and the Observatories Branch, all of the Department of Energy, Mines and Resources, and six Canadian universities. Industrial concerns also participated and the data obtained were exchanged between all parties. The knowledge of Hudson Bay gained on this cruise was probably greater than all available information to date.

Geologists studied the rocks of the sea floor, collecting many



A gravimeter is lowered to the floor of Hudson Bay to take spot measurements of the pull of gravity on the bottom

The underwater camera plus a heat probe



A technician repairs a heat probe

A collection of rock samples dredged from the sea floor

A bottom grab is used to obtain a sample of the floor of Hudson Bay

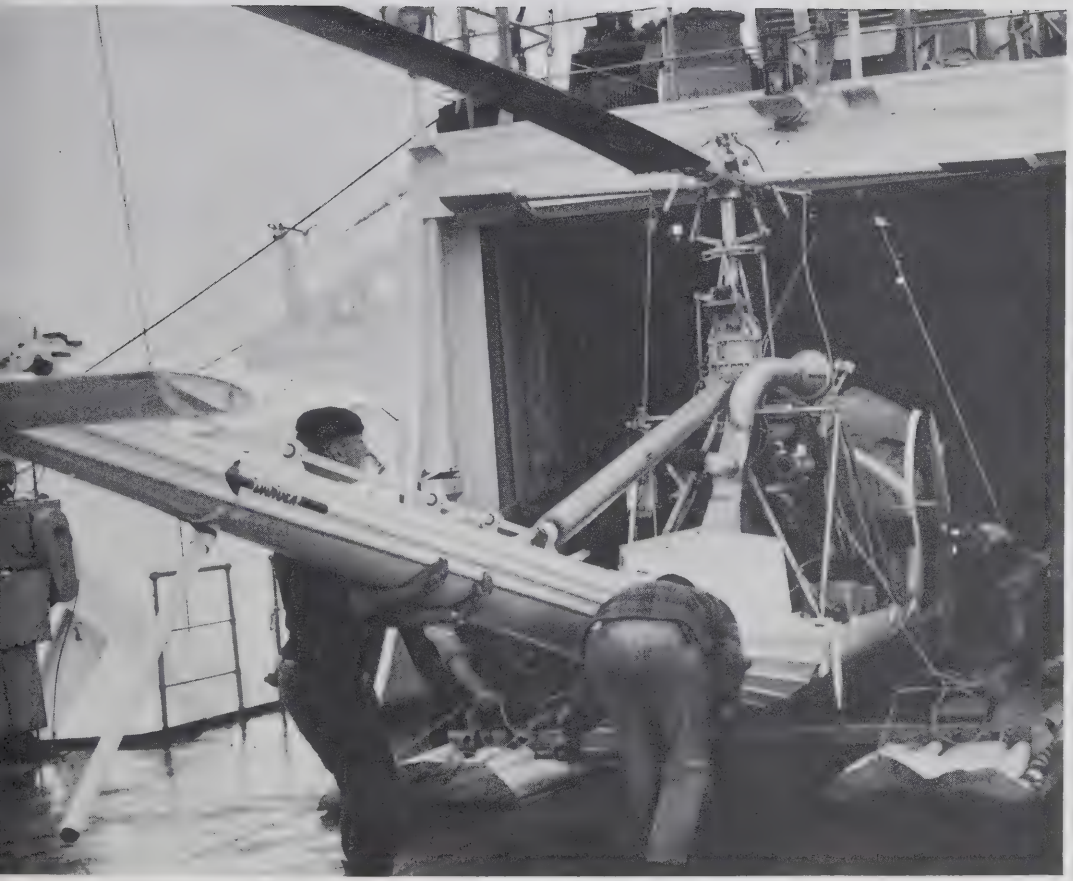
This tunicate was brought up in the mid-Atlantic

Samples of fresh pillow lava from the floor of the Median Rift Valley of the Mid-Atlantic Ridge, a vast mountain range in the Atlantic Ocean

samples and hundreds of photographs, and found that, in the long distant past, some parts now deep in Hudson Bay, used to form the shore line. They also found, high on the cliffs surrounding the Bay, other beaches which used to border the sea. Hydrographers charted the depth of water and investigated shoals which could pose hazards to navigation. Geophysicists studied the rocks beneath the sea floor, using all the tools and techniques at their disposal, including gravity and seismic methods and both air- and sea-borne magnetometer surveys. Biologists investigated the planktonic and benthonic organisms in the Bay, minute animals which form the food for larger marine animals and upon which all fish eventually depend for life.

Scientists at the Bedford Institute of Oceanography design and develop their own equipment, such as this rock core drill for use on the sea floor

A scientist "washes out" a sample of the ocean floor to see what interesting specimens it contains



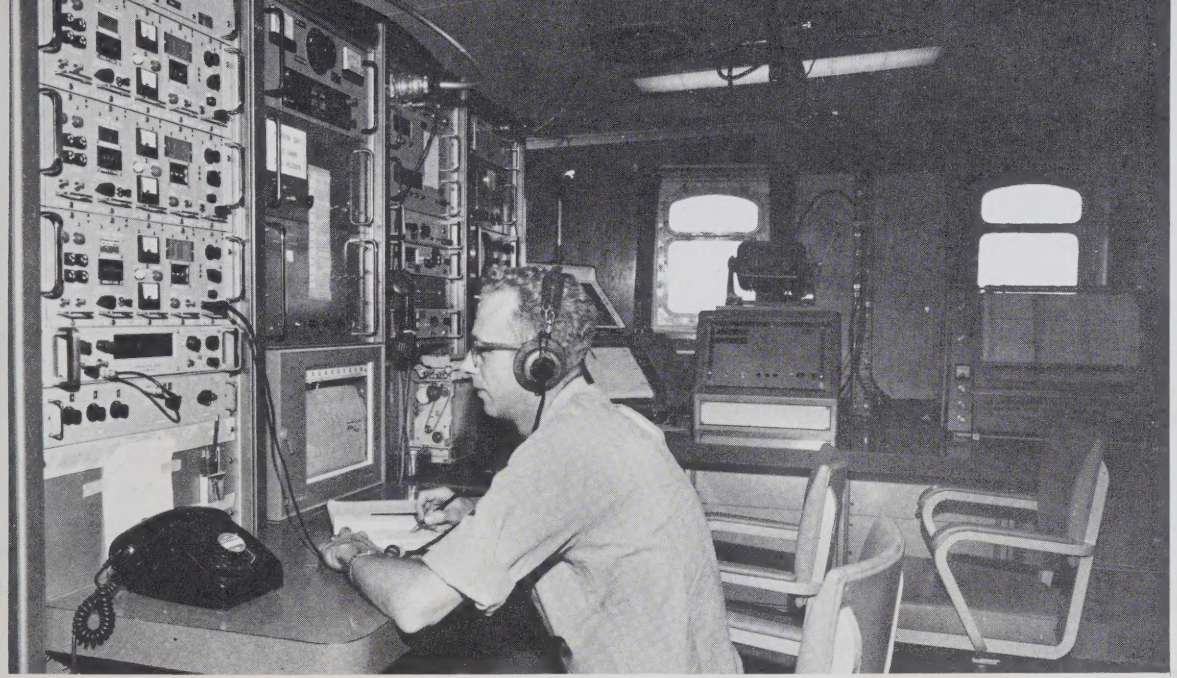
A helicopter is taken out of the hangar to scout for ice in Hudson Bay in 1965

Helicopters, Launches and Barges—The *Hudson* is equipped to carry and operate a helicopter, one 37-foot launch and a 31-foot landing barge. These craft are used to support field operations away from the ship and are especially useful in charting and survey work in remote areas.

Special Features—The ship's anti-rolling system, which is effective whether the ship is under way or stopped for station work, produces markedly better working conditions than those aboard an unstabilized vessel. A propeller arrangement in the forward end of the ship, called a bow-thruster, is an important aid in controlling the ship's movements on station or in any situation requiring close manoeuvering. A ship's well of some 42 inches in diameter permits the lowering of instruments through the ship's bottom.

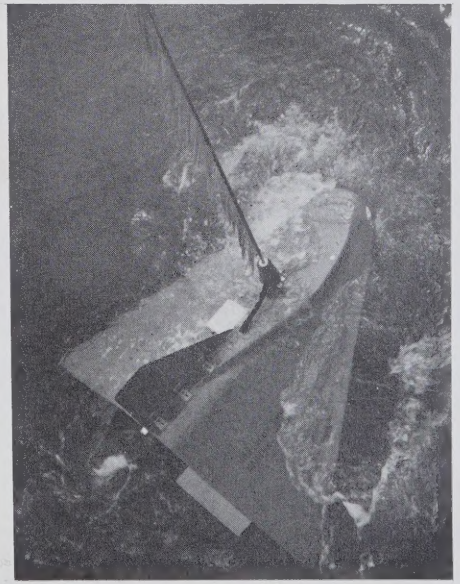
A helicopter prepares to take off from the flight deck while the ship tows the "snake", a cable strung with geophones, to obtain information on the structure of the floor of Hudson Bay (1965)

A woman geophysicist works on equipment at sea

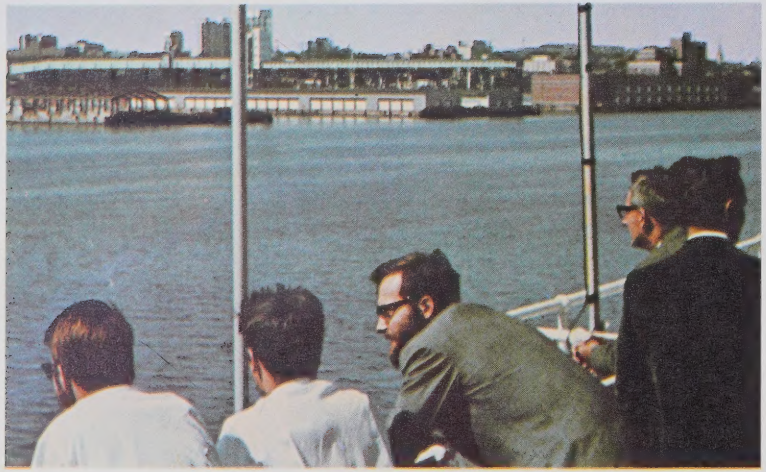


This geophysical data logger records on punched tape the time, ship's position and geophysical data. It was designed and developed by geophysicists of the Bedford Institute of Oceanography and greatly increases the geophysical capability of the ship

Biological oceanographers from universities and federal agencies have carried out several studies aboard *Hudson*. Their interests range over the whole complex process of life in the sea, from the simplest plankton, microscopic free-floating plants and animals to the commercially important food fish.



A V-fin with an echo-sounding transducer is towed below surface to obtain geophysical data



Entering Halifax harbor after a cruise, the scientists, as well as the crew, are anxious to get ashore

Text by Mary Giroux, photos by Mike Kelly, Norm Finnerty and Roger Belanger

Graceful and efficient, the *Hudson* is a powerful tool for the immense task ahead. She will log many cruises and will range far in her task because Canada, like other maritime nations of the world, has a responsibility in international oceanography.

Wherever she goes, whatever the task, to her scientists, officers and crew—GOD SPEED.

CSS HUDSON

Roger Duhamel, f.r.s.c., Queen's Printer and Controller of Stationery, Ottawa, 1967
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